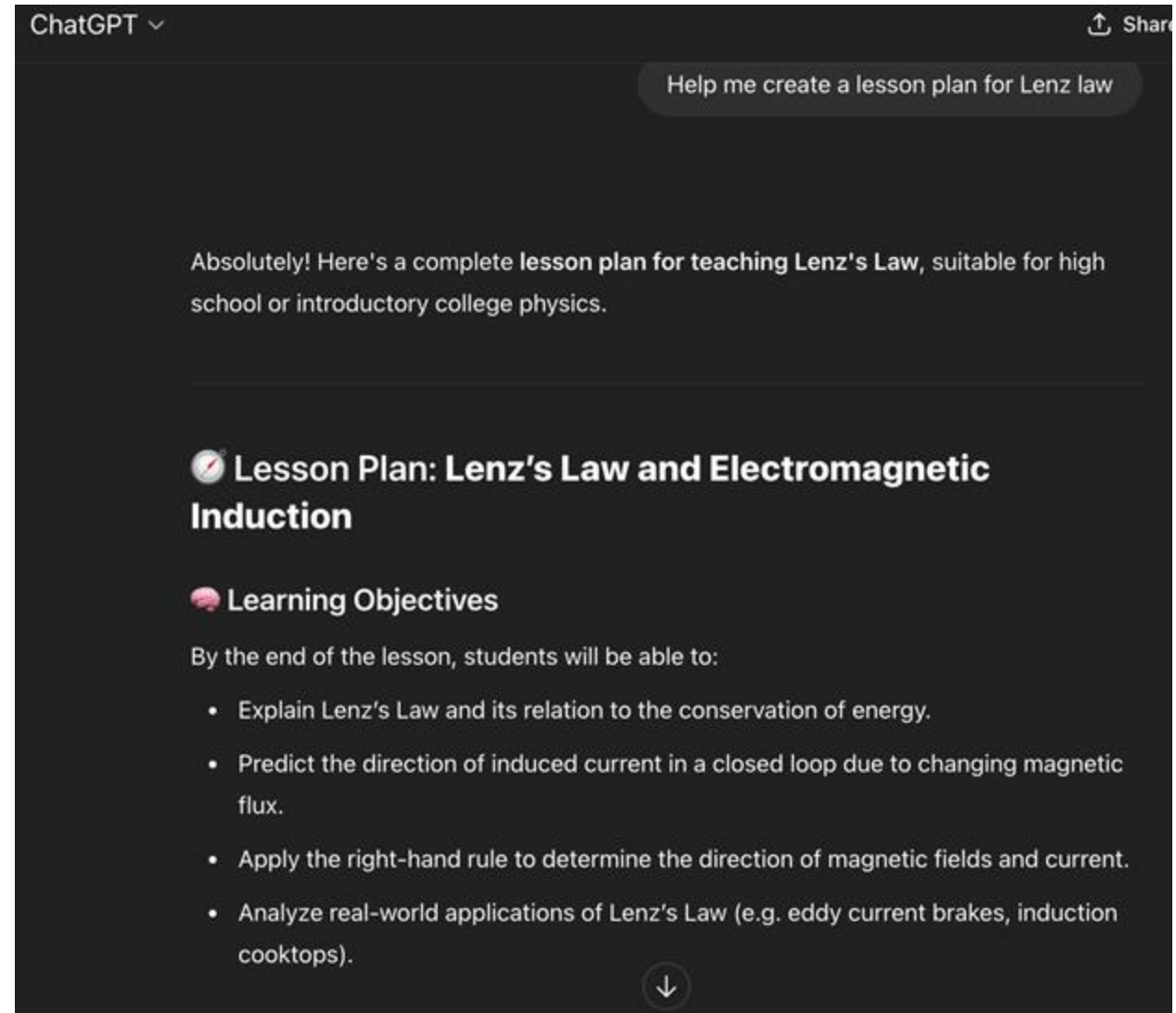


AI and Science Education

Heidi Wu

AI: Artificial Intelligence

- Large language models
- Examples: ChatGPT, Gemini, DeepSeek
- Simply speaking, it is **trained** by a large text database and **learns** to predict the next word of a sentence.
- They learn the **patterns** of the language



ChatGPT Share

Help me create a lesson plan for Lenz law


Absolutely! Here's a complete **lesson plan for teaching Lenz's Law**, suitable for high school or introductory college physics.

Lesson Plan: Lenz's Law and Electromagnetic Induction

Learning Objectives

By the end of the lesson, students will be able to:

- Explain Lenz's Law and its relation to the conservation of energy.
- Predict the direction of induced current in a closed loop due to changing magnetic flux.
- Apply the right-hand rule to determine the direction of magnetic fields and current.
- Analyze real-world applications of Lenz's Law (e.g. eddy current brakes, induction cooktops).



Will we teachers be out of jobs?

"Education is a social activity." (Veritasium)

AI also raises the bar for everyone.

Education-focused AI tools (free):

- PhET
- Wolfram Alpha
- [Khanmigo](#)
- Perplexity

I need to teach diffraction grating but I don't remember very much



Here are the 5 major concepts for diffraction grating at the college level:







1. **What a Diffraction Grating Is:** A tool with many closely spaced slits that splits light into patterns.
2. **How Diffraction Gratings Work:** Light waves spread out and make bright and dark spots because of interference.
3. **The Grating Equation:** The math that links slit spacing, light wavelength, and the angle of bright spots.
4. **Order of Maxima:** How to find the first, second, and higher bright spots in the pattern.
5. **Real-World Uses:** How diffraction gratings are used in science and technology.

Can you explain what a diffraction grating is and how it works? I'll listen and then ask you a follow-up question!

AI Hallucination

- "[AI] can make things up if they're unsure."
(ChatGPT)
- AI can put technical words together, but the sentence may not make sense.

Examples

- Text model (like ChatGPT):
 -  Hallucination: "The capital of Australia is Sydney."
 -  Truth: It's Canberra.
 -  Fabricated citation: "According to Smith et al., 2022..." (but the paper doesn't exist).
 -  Inventing code libraries or commands that don't exist.
- Image model:
 -  Generates a cat with three legs or extra eyes when prompted for a "normal cat".
 -  Misrepresents objects or scientific concepts.

Why It Matters

- In education, hallucinated facts can mislead learners.
- In healthcare, it could lead to unsafe advice.
- In law or journalism, fabricated citations or quotes are serious issues.

Demo: How students make AI do their homework

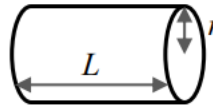
Pre-lab Lab 3: Ohm's Law

Name: _____

Grade: _____/5

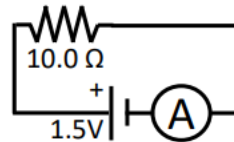
Answer the questions below. Writing down your calculations may earn you partial credit (use the back of the sheet if you need more space).

P1. A cylindrical object has radius 1.00×10^{-3} m and length 0.450 m, as shown, and is made of a conducting material with resistivity $3.30 \times 10^{-5} \Omega \cdot \text{m}$. What is the resistance of the cylinder along its length (in Ω)? [1]



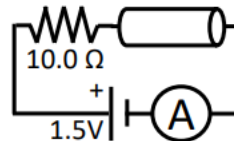
Ans:

P2. Consider the circuit diagram in the figure. What should be the reading of the ammeter (in A)? [1]



Ans:

P3. If the cylinder in P1 is connected to the circuit in P2, as shown, what should be the reading of the ammeter (in A)? [1]



Ans:

Let's solve each problem step by step using Ohm's Law and the resistance formula for a cylindrical conductor.

◆ P1. Resistance of a cylinder

Given:

- Radius $r = 1.00 \times 10^{-3} \text{ m}$
- Length $L = 0.450 \text{ m}$
- Resistivity $\rho = 3.30 \times 10^{-5} \Omega \cdot \text{m}$

Formula for resistance of a cylinder:

$$R = \rho \frac{L}{A}$$

Where $A = \pi r^2$ is the cross-sectional area.

Step 1: Calculate A

$$A = \pi(1.00 \times 10^{-3})^2 = \pi \times 10^{-6} \approx 3.1416 \times 10^{-6} \text{ m}^2$$

Step 2: Plug in values

$$R = \frac{3.30 \times 10^{-5} \times 0.450}{3.1416 \times 10^{-6}} \approx \frac{1.485 \times 10^{-5}}{3.1416 \times 10^{-6}} \approx 4.73 \Omega$$

✓ Answer to P1:

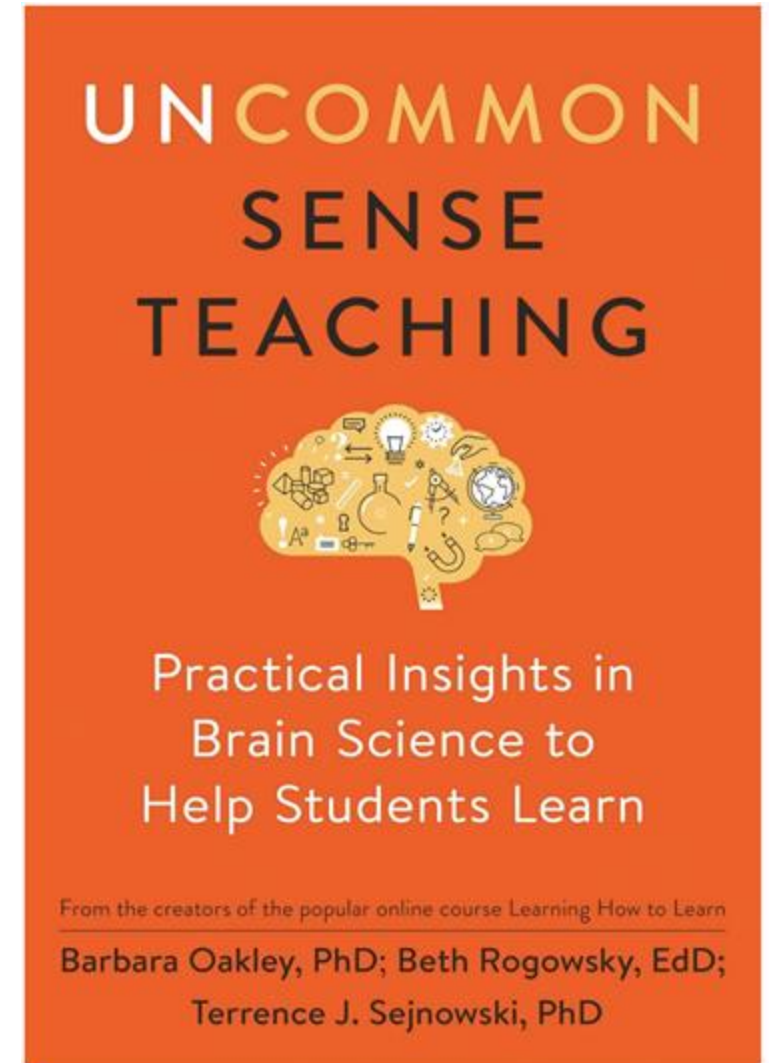
4.73 Ω

Tutoring or cheating?

- Before ChatGPT, there were Chegg, Course Hero, etc. ChatGPT makes cheating easier than ever. Take-home essay assignments are basically impossible.
- It's time to examine:
 - Why do we teach what we teach?
 - Why do we give the assignments we give?

Why we do what we do

- Working memory vs. long-term memory
- Focused mode vs. diffuse mode
- Motivation and emotion



Think - pair - share

- Your positive experience with AI
- Your negative experience with AI
- Would you encourage your students to use AI? Why or why not?